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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/017,534	Confirmation No.: 8068
Applicant	:	Isaac Ostrovsky	
Filing Date	:	10/18/2001	
Title	:	DIFFRACTION GRATING BASED INTERFEROMETRIC SYSTEMS AND METHODS	
Group Art Unit	:	2877	
Examiner	:	Patrick J. Connolly	
Docket No.	:	701470.19 (formerly 265/222)	
Customer No.	:	34313	

Attention: Office of Petitions
Mail Stop Petition
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Fax: (703) 872-9306

PETITION FOR REVIVAL OF AN APPLICATION FOR PATENT ABANDONED UNAVOIDABLY UNDER 37 CFR 1.137(a)

Sir:

The above-identified application became abandoned for failure to file a timely and proper reply to a notice or action by the United States Patent and Trademark Office. The date of abandonment is the day after the expiration date of the period set for reply in the Office notice or action plus extensions of time actually obtained.

APPLICANT HEREBY PETITIONS FOR REVIVAL OF THIS APPLICATION

06/22/2004 CNGUYEN 00000002 150665 10017534
02 FC:1453 1330.00 DA

CERTIFICATE OF MAILING OR TRANSMISSION 37 CFR §1.8(a)

I hereby certify, pursuant to 37 CFR §1.8, that I have reasonable basis to expect that that this paper or fee (along with any referred to as being attached or enclosed) would be mailed or transmitted on or before the date indicated with the United States Postal Service with sufficient postage as first class mail on the date shown below in an envelope addressed to the Commissioner for Patents, Mail Stop Petition, P.O. Box 1450, Alexandria, VA 22313-1450

or

I hereby certify, pursuant to 37 CFR §1.8, that this correspondence is being transmitted by facsimile on the date shown below to the United States Patent and Trademark Office at (703) 872-9306.

Dated: June 15, 2004

Karen Johnson
Karen Johnson

DOCSOC1:151621.1

1. PETITION FEE

☐ Small entity - fee $ 55.00 (37 CFR 1.17(m)). Applicant claims small entity status. See 37 CFR 1.27.

☒ Other than small entity – fee $ 130.00 (37 CFR 1.17(m)).

2. REPLY AND/OR FEE

A. The reply and/or fee to the above-noted Office action in the form of ______ ________________________ (identify type of reply);

☐ has been filed previously on ____________________

☒ is enclosed herewith.

B. The issue fee of $__________________

☐ has been paid previously on ____________________

☐ is enclosed herewith.

3. TERMINAL DISCLAIMER WITH DISCLAIMER FEE

☒ Since this utility/plant application was filed on or after June 8, 1995, no terminal disclaimer is required.

☐ A terminal disclaimer (and disclaimer fee (37 CFR 1.20(d)) of $_________ for a small entity or $__________ for other than a small entity) disclaiming the required period of time is enclosed herewith (See PTO/SB/63).

4. FEE PAYMENT

☐ Enclosed is a check for the sum of $______________
☒ Please charge Account No. 15-0665 the sum of $ 130.00 .
A duplicate of this sheet is attached.

5. AUTHORIZATION TO CHARGE ANY FEE DEFICIENCY

☒ The Commissioner is hereby authorized to charge any surcharge fee deficiency to Account No. 15-0665.

Applicant	:	Isaac Ostrovsky
Appl. No.	:	10/017,534
Examiner	:	Patrick J. Connolly
Docket No.	:	701470.19 (formerly 265/222)

6. STATEMENT

The enclosed statement will show that the entire delay in filing the required reply from the due date for the required reply until the filing of a grantable petition under 37 CFR 1.137(a) was unavoidable.

Respectfully submitted,

ORRICK, HERRINGTON & SUTCLIFFE LLP

Dated: June 15, 2004

By: ______________________

Joseph K. Liu
Reg. No. 51,957

Orrick, Herrington & Sutcliffe LLP
4 Park Plaza, Suite 1600
Irvine, CA 92614-2558
Tel. 949-567-6700
Fax: 949-567-6710

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/017,534	Confirmation No.: 8068
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STATEMENT IN SUPPORT OF THE PETITION FOR REVIVAL OF AN APPLICATION FOR PATENT ABANDONED UNAVOIDABLY UNDER 37 CFR 1.137(a)

1. My name is Joseph K. Liu, and I am a patent attorney of record for U.S. Patent Application No. 10/017,534, filed 10/18/2003, and I am currently employed at the law firm of Orrick, Herrington, & Sutcliffe ("Orrick"), in the Orange County office at 4 Park Plaza, Suite, 1600, Irvine, CA. 92614. I do hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true.

CERTIFICATE OF MAILING OR TRANSMISSION 37 CFR §1.8(a)

I hereby certify, pursuant to 37 CFR §1.8, that I have reasonable basis to expect that that this paper or fee (along with any referred to as being attached or enclosed) would be mailed or transmitted on or before the date indicated with the United States Postal Service with sufficient postage as first class mail on the date shown below in an envelope addressed to the Commissioner for Patents, Mail Stop Petition, P.O. Box 1450, Alexandria, VA 22313-1450

or

I hereby certify, pursuant to 37 CFR §1.8, that this correspondence is being transmitted by facsimile on the date shown below to the United States Patent and Trademark Office at (703) 872-9306.

Dated: June 15, 2004

Karen Johnson
Karen Johnson

DOCSOC1:151621.1

2. On November 26, 2003, Orrick received a Final Office Action for U.S. Patent App. 017,534, dated November 24, 2003, from Examiner Patrick Connolly, a copy of which is attached as Exhibit A.

3. The Final Office Action provided a final rejection for all the pending claims. I subsequently called the Examiner, Mr. Patrick Connolly, requesting an interview, some time in mid-February 2004. The Examiner and I spoke informally on the phone regarding the case, and I informed him that I had an "Amendment after Final Office Action" for his review and explained some of the details of my proposed amendment, which he said he would take into consideration. I offered to either mail or fax the Amendment to him. The Examiner requested that I fax the Amendment to the following fax number, 571-273-0810, which he represented was a direct fax number to his office. (I spoke with the Examiner on June 15, 2004 to confirm this fact, and he said that he did not recall giving me that fax number; however, he could not deny that he gave me that number.)

4. In response to the Examiner's request, we faxed a copy of the Amendment on February 20, 2004, a copy of which is attached as Exhibit B. The transmission report, a copy of which is attached as Exhibit C, indicated that transmission was successful (RESULT OK).

5. On or about April 29, the Examiner contacted me to inform me that he had never received the fax of February 20, 2004. Accordingly, on April 29, 2004, we faxed another copy of the February 20 Amendment to fax number, 703-872-9306, a copy of which is attached as Exhibit D. In response, I received an official receipt confirmation from the Patent Office, a copy of which is attached as Exhibit E.

6. On June 7, 2004, I received an Advisory Action in response to our fax of April 29, 2004, dated June 2, 2004, one day after the six month statutory deadline for replying to a Final Office Action (mailed November 29, 2004). A copy of the Advisory Action is attached as Exhibit F. The Advisory Action stated that the Amendment was not entered because "they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal." This is the first and only response we ever received to the Amendment we faxed on April 29, 2004. Prior to

the Advisory Action, my informal discussions with the Examiner led me to believe that the Amendment after Final would be accepted by the Examiner, when in fact, the Examiner ultimately rejected the Amendment.

7. On June 14, 2004, I contacted the Examiner about his failure to send his Advisory Action to us until after the six month statutory deadline. The Examiner responded that, given the facts, he has no intention of submitting a notice of Abandonment if we intend to promptly file a Request for Continued Examination. However, although I stated that I want to file a Request for Continued Examination, it would be too late because his Advisory Action was mailed after the six month statutory period had already expired.

8. It is my belief that there are two reasons for the delay. First, the Examiner for some reason did not receive my fax of February 20, 2004, which was faxed to a number that the Examiner directed me to and which, according to my facsimile transmission report, was faxed successfully. Second, the Examiner did not respond to my Amendment timely filed on April 29, 2004 until after the six month statutory deadline for filing a Request for Continued Examination. Thus, I had no opportunity under these circumstances to know that the Examiner's decision would come late, be adverse, and force me to file a Request for Continued Examination by June 1, 2004.

Respectfully submitted,
ORRICK, HERRINGTON & SUTCLIFFE LLP

Dated: June 15, 2004

By: ______________________
Joseph K. Liu
Reg. No. 51,957

Orrick, Herrington & Sutcliffe LLP
4 Park Plaza, Suite 1600
Irvine, CA 92614-2558
Tel. 949-567-6700
Fax: 949-567-6710

K

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/017,534	10/18/2001	Isaac Ostrovsky	265/222 701470.19	8068

34313 7590 11/24/2003

ORRICK, HERRINGTON & SUTCLIFFE, LLP
4 PARK PLAZA
SUITE 1600
IRVINE, CA 92614-2558

EXAMINER	
CONNOLLY, PATRICK J	
ART UNIT	**PAPER NUMBER**
2877	

DATE MAILED: 11/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

2/24/03
Response to OA Final
DEW
DMD
11/26/03

RECEIVED
NOV 26 2003
IRVINE OFFICE

PTO 90C (Rev 10/03)

Office Action Summary	Application No. 10/017,534	Applicant(s) OSTROVSKY ET AL.
	Examiner Patrick J Connolly	Art Unit 2877

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

Due 2/24/03

Final

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 22 September 2003.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-63 is/are pending in the application.

4a) Of the above claim(s) ______ is/are withdrawn from consideration.

5)☐ Claim(s) ______ is/are allowed.

6)☒ Claim(s) 1-63 is/are rejected.

7)☐ Claim(s) ______ is/are objected to.

8)☐ Claim(s) ______ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 18 October 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. ______.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ______ .
4) ☐ Interview Summary (PTO-413) Paper No(s). ______ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Response to Arguments

Applicant's arguments filed September 22, 2003 have been fully considered but they are not persuasive.

Regarding the rejection of claims 1-63, the applicant has argued that U.S. Patent 5,943,133 to Zeylikovich does not disclose the limitation of a "second sample light beam". What the applicant refers to as a "second sample light beam" is the reflected light from the sample. Zeylikovich clearly discloses sending a reflected light beam from the sample to a detector for analysis.

Zeylikovich also discloses a diffracted reference light beam (see Figures 1 and 2) and combining the reference and sample light beams for detection through the use of beamsplitters.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3-5, 58 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by U.S. Patent No. 5,943,133 to Zeylikovich et al (hereafter Zeylikovich).

As to claims 1 and 58, Zeylikovich discloses an apparatus and method of using including (see Figure 1, also column 4):

a low coherence light source (see column 5, lines 7-8 and Figure 29, diode laser);

a first beam splitter (BS1);

a diffraction grating (11);

a second beam splitter (BS2); and

a detector (23).

As to claim 3, Zeylikovich discloses a reflective diffraction grating (see column 4, lines 31, 32).

As to claim 4, Zeylikovich discloses a multi element photo detector (see for example Figure 6, 34).

As to claim 5, Zeylikovich discloses a signal processor (25).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 21, 22, 24, 25, 29, 30, 32, 35, 37, 38, 41, 43, 44, 47 48, 60 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,943,133 to Zeylikovich et al.

As to claims 21 and 22, Zeylikovich teaches using fibers to transport light (see lines 30-40, also Figures 29, 30).

As to claims 24, 35, 37 and 60, the use of focusing and conjugating lenses and collimators are notoriously well known in the art and it would have been obvious to on of ordinary skill in the art at the time of invention to include such optics in the apparatus of Zeylikovich.

As to claim 25 and 44, Zeylikovich teaches a reflective diffraction grating (see column 4, lines 31, 32).

As to claim 29 and 43, Zeylikovich teaches a phase modulator (see Figure 6, AOM, also column 7, first paragraph).

As to claim 30, 47 and 55, Zeylikovich teaches a signal processor (25).

As to claim 31 and 48, Zeylikovich teaches using a pulsed laser (see column 1, also Figure 1).

As to claims 32, 38 and 54, Zeylikovich teaches a multi element photo detector (see for example Figure 6, 34).

As to claim 41, interferometers that use a light source with a wavelength band that induces fluorescence are notoriously well known in the art and it would have been obvious to one of ordinary skill in the art at the time of invention to include such a light source in the apparatus of Zeylikovich if the fluorescent properties of the sample were of interest.

As to claim 63, Zeylikovich teaches measuring a biological tissue (see column 1)

As to the claims above, it would have been obvious to one of ordinary skill in the art at the time of invention to combine various elements from the various embodiments of Zeylikovich's apparatus, as the advantages of these elements are well known and taught within the specification of Zeylikovich.

Claims 2 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zeylikovich as applied to claim 1 above, and further in view of "Nonmechanical grating-generated scanning coherence microscopy" by Zeylikovich et al (hereafter "Nonmechanical ...").

As to claims 2 and 20, while U.S. Patent No. 5,943,133 to Zeylikovich et al teaches diffracting both the reference and the sample light beams, "Nonmechanical ..." teaches a similar interferometer for optical coherence-domain reflectometry diffracting only the reference beam. It would have been obvious to one of ordinary skill in the art at the time of invention to configure the apparatus of U.S. Patent No. 5,943,133 to Zeylikovich to only diffract the reference beam in the manner taught in "Nonmechanical ...".

Claim 6-8 and 16-18, 39, 40, 53, 56 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,943,133 to Zeylikovich as applied to claim 1 above, and further in view of U.S. Patent No. 5,459,570 to Swanson et al (hereafter Swanson).

As to claims 6, 7, 39, 40, 53, 56 and 57, Swanson teaches an optical coherence domain reflectometer including (see Figure 6):

two detectors (42C, 42D); and

polarization filters positioned to filter a first and second combined beams respectively with respect to respective polarizations (116)

It would have been obvious to one of ordinary skill in the art to configure the apparatus of Zeylikovich to include the polarization analysis of Swanson.

As to claim 8, it would have been obvious to one of ordinary skill in the art at the time of invention to have both detectors be multi-element detectors as Zeylikovich already discloses a single multi-element detector (see above).

As to claims 16-18 and 40, Swanson teaches an optical coherence domain reflectometer including (see Figure 3, column 10, lines 12-17):

two low coherence light sources (12A and 12B); and

two multi-element detectors positioned to receive combined light beams, each detector configured to detect light at a respective wavelength of the sources (42).

It would have been obvious to one of ordinary skill in the art to configure the apparatus of Zeylikovich to include the wavelength analysis of Swanson.

Claims 9-12, 13-15, 23, 26-27 34, 36, 45, 46, 49-52, 58, 59, 61 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,943,133 to Zeylikovich as applied to claim 1 above, and further in view of U.S. Patent No. 6,143,003 to Tearney et al (hereafter Tearney).

As to claims 9-12, 14, 15, 26-27, 34, 36, 42, 49-52, 58, 59, 61 and 62, Tearney teaches a method and apparatus for performing optical coherence tomography including an interferometer (see Figure 3, column 6, lines 15-25). In the interferometer, Tearney teaches that the optical couplers (acting as beam splitters) do not have to divide radiation equally. Tearney goes on to explain that the division of radiation should be determined by noise limitations. It would have been obvious to one of ordinary skill in the art at the time of invention to choose a combination beamsplitters of different proportions in the apparatus of Zeylikovich in order to improve measurements.

As to claims 13 and 33, Tearney teaches using optical circulators to direct light beams (Figure 3, 30). Optical circulators are notoriously well known in the fiber art. It would have been obvious to one of ordinary skill in the art at the time of invention to include circulators for light direction in the apparatus of Zeylikovich.

As to claims 28, 45, and 46, Tearney teaches using attaching an interferometer to a catheter (see Figure 12, also column 12). It would have been obvious to one of ordinary skill in the art at the time of invention to attach a catheter to the apparatus of Zeylikovich (see also column 1 of Zeylikovich).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick J Connolly whose telephone number is ~~703.305.4397~~. The examiner can normally be reached on 9 am-5.30 pm ... Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 703.308.4881. The fax phone numbers for the organization where this application or proceeding is assigned are 703.746.7722 for regular communications and 703.746.7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is ~~703-308~~-0956.

Frank G Font

Frank G. Font
Supervisory Patent Examiner
Technology Center 2800

pjc PJC
November 14, 2003

Patent
701470.19

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:	Group Art Unit: 2877
Isaac Ostrovsky, et al.	Examiner: Patrick J. Connolly
Serial No.: 10/017,534	Customer No.: 34313
Filed: October 18, 2001	
For: **Diffraction Grating Based Interferometric Systems and Methods**	

AMENDMENT TRANSMITTAL

MAIL STOP **AF**
Commissioner for Patents
P.O. Box 1450
Arlington, Virginia 22313-1450

Sir:

Transmitted herewith is an Amendment for the above-identified application.

☐ Applicant(s) petitions for an extension of time under 37 CFR § 1.136 [fees: 37 CFR § 1.17(a)(1)-(5)] for the total number of months checked below:

EXTENSION (months)	**FEE FOR SMALL ENTITY**	**FEE FOR OTHER THAN SMALL ENTITY**
1 month	☐ $55.00	☐ $110.00
2 months	☐ $205.00	☐ $410.00
3 months	☐ $465.00	☐ $930.00
4 months	☐ $725.00	☐ $1,450.00
5 months	☐ $985.00	☐ $1,970.00

☐ An extension for _____ months has already been secured and the fee paid therefor of _____ is deducted from the total fee due for the total months of extension now requested.

CERTIFICATE OF TRANSMISSION

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being transmitted via facsimile (571/273-0810) on the date shown below to the Commissioner for Patents, P.O. Box 1450, Alexandria 22313-1450.

February 20, 2004
Date of Transmission

Sally Hartwell
Sally Hartwell

DOCSOC1:147772.1

☐ Extension fee due with this Request $____________.

☒ If an additional extension of time is required, please consider this a petition therefor.

FEES FOR CLAIMS:

☐ Applicant claims small entity status pursuant to 37 CFR 1.27.

The fees for claims (37 CFR § 1.16(b)-(d)) have been calculated as shown below:

Total Claims	63	-	73	=	0	x	$18.00	$0.00
Independent Claims	6	-	7	=	0	x	$84.00	$0.00
Multiple Dependent Claims	$280	(if applicable)					☐	$0.00
TOTAL OF ABOVE CALCULATIONS								$0.00
Reduction by ½ for Filing by Small Entity. Note 37 CFR §§ 1.9, 1.27, 1.28.							☐	$0.00
TOTAL FEES FOR CLAIMS SUBMITTED HEREWITH								$0.00

☐ A check in the amount of _____ is enclosed to cover the above fee(s).

☐ Charge Orrick's Deposit Account No. **15-0665** in the amount of $____.

☒ The Commissioner is authorized to charge Orrick's Deposit Account No. **15-0665** for any fees required under 37 CFR §§ 1.16 and 1.17 that are not covered, in whole or in part, by a check enclosed herewith and to credit any overpayments to said Deposit Account .

Respectfully submitted,

Orrick, Herrington, & Sutcliffe LLP

Dated: February 20, 2004

By: ____________________
Joseph K. Liu
Reg. No. 51,957

4 Park Plaza, Suite 1600
Irvine, California 92614-2558
(949) 567-6700
Customer No. 34313

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Isaac Ostrovsky, et al.
Appl. No.	:	10/017,534
Filing Date	:	October 18, 2001
Title	:	**DIFFRACTION GRATING BASED INTERFEROMETRIC SYSTEMS AND METHODS**
Group Art Unit	:	2877
Examiner	:	Patrick J. Connolly
Docket No.	:	701470.19 (formerly 265/222)

Mail Stop **AF**
Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT AFTER FINAL OFFICE ACTION 37 C.F.R. § 1.116

Sir:

In response to the final Office Action mailed November 24, 2003, Applicants respond as follows:

CERTIFICATE OF TRANSMISSION

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being transmitted via facsimile (571/273-0810) on the date shown below to the Commissioner for Patents, P.O. Box 1450, Alexandria 22313-1450.

February 20, 2004
Date of Transmission

Sally Hartwell
Sally Hartwell

DOCSOC1:147772.1

Amendments to the Claims

1. (currently amended) An interferometer comprising:

a low coherence light source;

a first beam splitter in communication with the light source to split light from the light source into a ~~first~~ sample light beam to be directed onto a sample and a reference light beam, wherein a ~~second~~ reflected sample light beam is received by the interferometer from the sample;

a diffraction grating positioned to diffract at least one of the reference light beam and the ~~second~~ reflected sample light beam;

a second beam splitter positioned to receive the ~~second~~ reflected sample light beam and the reference light beam, wherein at least one of the ~~second~~ reflected sample light beam and the reference light beam has been diffracted by the diffraction grating, and the ~~second~~ reflected sample light beam and the diffracted reference light beam are combined in the second beam splitter to form a combined light beam; and

a detector positioned to receive the combined light beam from the second beam splitter.

2. (currently amended) The interferometer of claim 1, wherein the diffraction grating is positioned to diffract the reference light beam and the ~~second~~ reflected sample light beam is directed onto the second beam splitter without being diffracted.

3. (original) The interferometer of claim 1, wherein the diffraction grating is a reflective diffraction grating, a transparent diffraction grating or an acousto optic modulator.

4. (original) The interferometer of claim 1, wherein the detector is a multi-element

photo detector.

5. (original) The interferometer of claim 1, further comprising a signal processor electrically coupled to the detector to receive an output from the detector and to process the output.

6. (original) The interferometer of claim 1, wherein the second beam splitter forms first and second combined light beams, the first combined light beam being received by the first detector, the interferometer further comprising:

a second detector positioned to detect the second combined light beam.

7. (original) The interferometer of claim 6, further comprising first and second polarization filters positioned to filter the first and second combined light beams, respectively, with respect to first and second respective polarizations.

8. (original) The interferometer of claim 6, wherein the first and second detectors are each multi-element detectors.

9. (currently amended) The interferometer of claim 1, wherein:

the first beam splitter is an approximately 50/50 beam splitter; and

the second beam splitter directs more than half of the light energy of the ~~second~~ reflected sample light beam into the combined beam and directs less than half of the light energy of the reference light beam into the combined beam.

10. (currently amended) The interferometer of claim 9, wherein the second beam splitter directs substantially more than half of the light energy of the ~~second~~ reflected sample light beam into the combined light beam and directs substantially less than half of the light energy of the reference light beam into the combined beam.

11. (currently amended) The interferometer of claim 10, wherein the second beam splitter directs at least about 90% of the light energy of the ~~second~~ reflected sample light beam into the combined light beam and directs about 10% or less of the light energy of the reference light beam into the combined light beam.

12. (original) The interferometer of claim 1, wherein the first beam splitter directs more than half of the light energy received from the light source into the sample light beam and less than half of the light energy received from the light source into the reference light beam.

13. (currently amended) The interferometer of claim 12, further comprising an optical circulator, wherein the sample light beam is directed to the sample through the optical circulator and the ~~second~~ reflected sample light beam is directed to the second beam splitter through the optical circulator.

14. (original) The interferometer of claim 12, wherein the second beam splitter directs substantially more than half of the light energy received from the light source into the sample light beam and substantially less than half of the light energy received from the light source into the reference light beam.

15. (original) The interferometer of claim 14, wherein the first beam splitter directs at least about 90% of the light energy received from the light source into the sample light beam and about 10% or less of the light energy received from the light source into the reference light beam.

16. (currently amended) An interferometer comprising:

a first low coherence light source and a second low coherence light source, each emitting light at a different wavelength;

a first beam splitter in communication with the first and second light sources to

split the light from the light sources into a ~~first~~ sample light beam to be directed onto a sample and a reference light beam, wherein a ~~second~~ reflected sample light beam is received by the interferometer from the sample;

a diffraction grating positioned to diffract at least one of the reference light beam and the ~~second~~ reflected sample light beam;

a second beam splitter positioned to receive the reference light beam and the ~~second~~ reflected sample light beam, wherein at least one of the reference light beam and the sample light beam has been diffracted by the diffraction grating, the second beam splitter forming two combined light beams;

a first detector positioned to receive one of the combined light beams; and

a second detector positioned to receive the other of the combined light beams.

17. (original) The interferometer of claim 16, wherein the first detector detects light at the wavelength of the first light source and the second detector detects light at the wavelength of the second light source.

18. (original) The interferometer of claim 16, wherein the first and second detectors are multi-element detectors.

19. (original) The interferometer of claim 16, wherein one of the light sources emits light in a wavelength band that induces fluorescence in the sample.

20. (currently amended) The interferometer of claim 16, wherein:

the reference light beam is diffracted by the diffraction grating; and

the reflected ~~second~~ reflected sample light beam is directed onto the second beam splitter, undiffracted.

21. (original) The interferometer of claim 16, wherein light is conveyed from the first and second light sources to the beam splitter by an optical fiber.

22. (currently amended) An interferometer comprising:

a low coherence light source;

a first, fiber optic beam splitter;

a first optical fiber optically coupling the light source to the first beam splitter, wherein the first beam splitter splits light received from the light source into a sample light beam and a reference light beam;

a second optical fiber to convey the sample light beam onto a sample and to convey a ~~second~~ reflected sample light beam received from the sample to the first beam splitter;

a second beam splitter;

a third optical fiber optically coupling the first beam splitter to the second beam splitter to convey the ~~second~~ reflected sample light beam, at least in part, from the first beam splitter to the second beam splitter;

a diffraction grating;

a fourth optical fiber optically coupling the first beam splitter to the diffraction grating to convey the reference light beam, at least in part, to the diffraction grating;

wherein the second beam splitter is positioned to receive the diffracted reference light beam and the reference light beam and the ~~second~~ reflected sample light beam are combined in the second beam splitter to form a combined light beam; and

a detector positioned to receive the combined light beam.

23. (original) The interferometer of claim 22, wherein:

the first beam splitter is an approximately 50/50 beam splitter; and

the second beam splitter directs more than half of the light energy received from the light source into the sample light beam and less than half of the light energy received from the light source into the reference light beam.

24. (currently amended) The interferometer of claim 22, further comprising:

a focusing lens to focus the sample light beam onto the sample and to focus the ~~second~~ reflected sample light beam;

a first collimator optically coupled between the third optical fiber and the second beam splitter such that the third optical fiber conveys the ~~second~~ reflected sample light beam to the first collimator to collimate the ~~second~~ reflected sample light beam and the collimated sample light beam is directed to the second beam splitter;

a second collimator optically coupled between the fourth optical fiber and the diffraction grating such that the fourth optical fiber conveys the reference light beam to the second collimator to collimate the reference light beam and the collimated reference light beam is directed onto the diffraction grating; and

a conjugating lens between the second beam splitter and the detector.

25. (original) The interferometer of claim 22, wherein the diffraction grating is a reflective diffraction grating, a transparent diffraction grating, or an acousto-optic modulator.

26. (original) The interferometer of claim 22, wherein the second beam splitter directs substantially more than 50% of the light energy received from the light source into the sample light beam and substantially less than 50% of the light energy received from the light

source into the reference light beam.

27. (original) The interferometer of claim 26, wherein the second beam splitter directs at least about 90% of the light energy received from the light source into the sample light beam and about 10% or less of the light energy from the light source into the reference light beam.

28. (original) The interferometer of claim 22, further comprising a catheter and an optical fiber within the catheter, wherein the second optical fiber is optically coupled to the optical fiber within the catheter.

29. (original) The interferometer of claim 22, further comprising a phase modulator to modulate either of the reference light beam and the sample light beam.

30. (original) The interferometer of claim 22, further comprising a signal processor electrically coupled to the detector to receive an output from the detector and to process the output.

31. (original) The interferometer of claim 22, wherein the light source is pulsed.

32. (original) The interferometer of claim 22, wherein the detector is a multi-element photo detector.

33. (currently amended) An interferometer comprising:

a low coherence light source;

a first fiber optic beam splitter;

a first optical fiber optically coupling the light source to the first beam splitter, wherein the first beam splitter splits light received from the light source into a sample light beam and a reference light beam;

an optical circulator having a first port, a second port and a third port, wherein light input to the first port exits the optical circulator from the second port and light entering the second port exits the optical circulator from the third port;

a second optical fiber optically coupling the first beam splitter to the first port of the optical circulator;

a third optical fiber to convey the sample light beam to a sample and to convey a ~~second~~ reflected sample light beam received from the sample to the first beam splitter;

a second beam splitter;

a fourth optical fiber optically coupling the third port of the optical circulator to the second beam splitter, wherein the third optical fiber conveys the ~~second~~ reflected sample light beam, at least in part, from the third port to the second beam splitter;

a diffraction grating;

a fifth optical fiber optically coupling the first beam splitter to the diffraction grating to convey the reference light beam, at least in part, to the diffraction grating;

the second beam splitter being positioned to receive the diffracted reference light beam from the diffraction grating, wherein the reference light beam and the ~~second~~ reflected sample light beam combine in the beam splitter to form a combined light beam; and

a detector positioned to receive the combined beam

34. (original) The interferometer of claim 33, wherein the light received from the light source has an energy and the first beam splitter splits the light into a sample light beam having more than half of the energy of the light and a reference light beam having less than half of the energy of the light.

35. (currently amended) The interferometer of claim 34, further comprising:

a focusing lens to focus the sample light beam onto the sample and to focus the ~~second~~ reflected sample light beam;

a first collimator optically coupled between the fourth optical fiber and the second beam splitter such that the fourth optical fiber conveys the ~~second~~ reflected sample light beam to the first collimator to collimate the ~~second~~ reflected sample light beam and the collimated sample light beam is directed to the second beam splitter;

a second collimator optically coupled between the fifth optical fiber and the diffraction grating such that the fifth optical fiber conveys the reference light beam to the second collimator to collimate the reference light beam and the collimated reference light beam is directed onto the diffraction grating; and

a conjugating lens between the second beam splitter and the detector.

36. (currently amended) The interferometer of claim 34, wherein the second beam splitter is an approximately 50/50 beam splitter and the ~~second~~ reflected sample light beam and the reference light beam are combined in the second beam splitter to form first and ~~second~~ reflected sample light beams, wherein the first combined light beam is received by the first detector; and

the interferometer further comprises a second detector positioned to receive a second combined light beam from the second beam splitter.

37. (original) The interferometer of claim 34, further comprising first and second conjugating lens between the first detector and the second beam splitter and the second detector and the second beam splitter, respectively.

38. (original) The interferometer of claim 36, wherein the first and second detectors are each a multi-element photo detector.

39. (original) The interferometer of claim 36, further comprising first and second polarization filters positioned to filter the first and second combined light beams, respectively, with respect to first and second respective polarizations.

40. (original) The interferometer of claim 36, further comprising:

a second light source optically coupled to the first optical fiber, the second light source emitting light at a wavelength different than the wavelength of the first light source;

wherein the first detector detects light at a wavelength corresponding to the wavelength of the light emitted by the first light source and the second detector detects light at a wavelength corresponding to the wavelength of the light emitted by the second light source.

41. (original) The interferometer of claim 40, wherein one of the light sources emits light in a wavelength band that induces fluorescence in the sample.

42. (currently amended) The interferometer of claim 34, wherein the second beam splitter directs more than half of the energy in the ~~second~~ reflected sample light beam into the combined beam and less than half of the energy in the reference light beam into the combined beam.

43. (currently amended) The interferometer of claim 34, further comprising a phase modulator to modulate either one of the reference light beam and the ~~second~~ reflected sample light beam

44. (original) The interferometer of claim 34, wherein the diffracting grating is a reflective diffraction grating, a transparent diffraction grating, or an acousto-optic modulator

45. (original) The interferometer of claim 36, further comprising a catheter, wherein at least a portion of the third optical fiber is within the catheter.

46. (original) The interferometer of claim 34, further comprising a catheter, wherein at least a portion of the third optical fiber is within the catheter.

47. (original) The interferometer of claim 34, further comprising:

a signal processor electrically connected to the detector to receive an output from the detector and to process the signals.

48. (original) The interferometer of claim 34, wherein the light source is pulsed.

49. (original) The interferometer of claim 34, wherein the first beam splitter splits the light received from the light source into a sample light beam having substantially more than half of the energy of the light and a reference light beam having substantially less than half of the energy of the light.

50. (original) The interferometer of claim 49, wherein the first beam splitter directs at least about 90% of the light energy received from the light source into the sample light beam and about 10% or less of the light energy received from the light source into the reference light beam.

51. (original) The interferometer of claim 36, wherein the first beam splitter splits the light received from the light source into a sample light beam having substantially more than half of the energy of the light and a reference light beam having substantially less than half of the energy of the light.

52. (original) The interferometer of claim 51, wherein the second beam splitter directs at least about 90% of the light energy received from the light source into the sample light beam and about 10% or less of the light energy received from the light source into the reference

light beam.

53. (currently amended) An interferometer comprising:

a low coherence light source;

a first beam splitter in communication with the light source to split light from the light source into a sample light beam to be directed onto a sample and a reference light beam wherein a second light beam is received by the interferometer from the sample;

a second beam splitter for generating two combined light beams from the ~~second~~ reflected sample light beam and the reference light beam, wherein an optical path difference has been introduced into at least one of the ~~second~~ reflected sample light beam and the reference light beam;

first and second detectors, each positioned to receive one of the combined light beams;

first and second polarization filters, each filtering light with respect to a different polarization, the first polarizing filter being between the second beam splitter and the first detector and the second polarizing filter being between the second beam splitter and the second detector.

54. (original) The interferometer of claim 54, wherein each detector is a multi-element detector.

55. (original) The interferometer of claim 54, further comprising a signal processor coupled to each detector to analyze the outputs of each detector.

56. (currently amended) The interferometer of claim 54, further comprising a diffraction grating to introduce the optical path difference to at least one of the ~~second~~ reflected

sample light beam and the reference light beam.

57. (original) The interferometer of claim 56, wherein the diffraction grating introduces the optical path difference to the reference light beam.

58. (currently amended) A method of imaging a sample material comprising the steps of:

splitting a low coherence light beam into a sample light beam and a reference light beam;

directing the sample light beam onto a sample and receiving a ~~second~~ reflected sample light beam from the sample;

diffracting one of the reference light beam and the ~~second~~ reflected sample light beam;

after the diffracting step, combining the ~~second~~ reflected sample light beam with the diffracted light beam by a beam splitter to form a combined light beam; and

detecting the combined light beam with a detector.

59. (original) The method of claim 58, further comprising the steps of:

splitting the low coherence light beam by a first, approximately 50/50 beam splitter; and

combining the light received from the sample with the diffracted reference light beam by a second non 50/50 beam splitter.

60. (original) The method of claim 59, further comprising the steps of:

conveying the low coherence light beam to a first beam splitter to split the light beam, by a first optical fiber;

conveying the sample light beam to a lens to focus the light beam onto the sample, by a second optical fiber;

conveying the light received from the sample back to the first beam splitter by the second optical fiber;

conveying the light received from the sample from the first beam splitter to a first collimator, by a third optical fiber;

conveying a collimated received light beam to the second beam splitter;

conveying the reference light beam from the first beam splitter to a second collimator by a fourth optical fiber; and

conveying a collimated reference light beam to a diffraction grating to diffract the collimated reference light beam.

61. (original) The method of claim 59, further comprising the step of combining the light received from the sample with the diffracted reference light beam to form a combined light beam having substantially more than half of the light energy of the light received from the sample and substantially less than half of the light energy of the diffracted reference light beam.

62. (original) The method of claim 61, comprising the step of combining the light received from the sample with the diffracted reference light beam to form a combined light beam having at least about 90% of the light energy of the light received from the sample and about 10% or less of the light energy of the diffracted reference light beam.

63. (original) The method of claim 59, wherein the sample is biological tissue.

Claims 64–73 (canceled)

REMARKS

Claims 1-63 are currently pending, of which claims 1, 16, 22, 33, 53, and 58 are independent. Claims 1, 2, 9, 10, 11, 13, 16, 20, 22, 24, 33, 35, 36, 42, 43, 53, 56, and 58 have been amended. "First sample light beam" and "second sample light beam" are now referred to as "sample light beam" and "reflected sample light beam" respectively. Applicants believe that the claims are now currently in condition for allowance over the cited prior art.

As to claims 1 and 58, while the Zeylikovich reference may teach an apparatus having first and second beam splitters, the reference does not disclose having a reflected sample light beam and a diffracted reference light beam combined in the second beam splitter to form a combined light beam as required by Claim 1. Nor does Zeylikovich disclose combining a reflected sample light beam with a diffracted light beam by a beam splitter to form a combined light beam as required by Claim 58.

As to claims 3-5, because claim 1 is patentably distinguishable over the Zeylikovich reference, then so are claims 3-5, which are dependent on claim 1.

Further, with regard to the Zeylikovich reference in combination with Swanson (U.S. Patent No. 5,459,570), and the Zeylikovich reference in combination with Tearney (U.S. Patent No. 6,134,003), none of these references, in combination or separately, teach or suggest combining the elements of the instant invention. Specifically, none of these references, in combination or separately, teach or suggest having a reflected sample light beam and a diffracted reference light beam combined in a second beam splitter as required by claims 1, 22, and 33; having a second beam splitter form two combined light beams from the reflected sample beam and the diffracted reference beam, as required by claim 16; having a second beam splitter for

generating two combined light beams from a reflected sample light beam and a reference light beam as required by 53; or combining a reflected sample light beam with a diffracted light beam by a beam splitter to form a combined light beam as required by claim 58.

Accordingly, independent claims 1, 16, 22, 33, 53 and 58 are patentable over the cited references, in combination or separately, as is the corresponding dependent claims.

Conclusion

Prompt and favorable action on the merits of the claims is earnestly solicited. Should the Examiner have any questions or comments, the undersigned can be reached at (949) 949-852-7745.

The Commissioner is authorized to charge any fee which may be required in connection with this Amendment to Deposit Account No. 150665.

Respectfully submitted,

ORRICK, HERRINGTON & SUTCLIFFE LLP

Dated: February 20, 2004

By: ______________________

Joseph K. Liu
Reg. No. 51,957

Orrick, Herrington & Sutcliffe LLP
4 Park Plaza, Suite 1600
Irvine, CA 92614-2558
Tel. 949-567-6700
Fax: 949-567-6710
Customer Number: 34313

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ORRICK, HERRINGTON &
SUTCLIFFE LLP
4 PARK PLAZA
SUITE 1600
IRVINE, CALIFORNIA 92614-2558
tel 949-567-6700
fax 949-567 6710
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SUITE 1600
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fax 949-567 6710
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ORRICK, HERRINGTON & SUTCLIFFE LLP
4 PARK PLAZA
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Patent
701470.19

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Isaac Ostrovsky, et al.

Serial No.: 10/017,534

Filed: October 18, 2001

For: **Diffraction Grating Based Interferometric Systems and Methods**

Group Art Unit: 2877

Examiner: Patrick J. Connolly

Customer No.: 34313

AMENDMENT TRANSMITTAL

MAIL STOP **AF**
Commissioner for Patents
P.O. Box 1450
Arlington, Virginia 22313-1450

Sir:

Transmitted herewith is an Amendment for the above-identified application.

☐ Applicant(s) petitions for an extension of time under 37 CFR § 1.136 [fees: 37 CFR § 1.17(a)(1)-(5)] for the total number of months checked below:

EXTENSION (months)	FEE FOR SMALL ENTITY	FEE FOR OTHER THAN SMALL ENTITY
1 month	☐ $55.00	☐ $110.00
2 months	☐ $205.00	☐ $410.00
3 months	☐ $465.00	☐ $930.00
4 months	☐ $725.00	☐ $1,450.00
5 months	☐ $985.00	☐ $1,970.00

☐ An extension for _____ months has already been secured and the fee paid therefor of _____ is deducted from the total fee due for the total months of extension now requested.

CERTIFICATE OF TRANSMISSION

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☐ Extension fee due with this Request $__________.

☒ If an additional extension of time is required, please consider this a petition therefor.

FEES FOR CLAIMS:

☐ Applicant claims small entity status pursuant to 37 CFR 1.27.

The fees for claims (37 CFR § 1.16(b)-(d)) have been calculated as shown below:

Total Claims	63	-	73	=	0	x	$18.00	$0.00
Independent Claims	6	-	7	=	0	x	$84.00	$0.00
Multiple Dependent Claims	$280	(if applicable)					☐	$0.00
TOTAL OF ABOVE CALCULATIONS								$0.00
Reduction by ½ for Filing by Small Entity. Note 37 CFR §§ 1.9, 1.27, 1.28.							☐	$0.00
TOTAL FEES FOR CLAIMS SUBMITTED HEREWITH								$0.00

☐ A check in the amount of _____ is enclosed to cover the above fee(s).

☐ Charge Orrick's Deposit Account No. **15-0665** in the amount of $____.

☒ The Commissioner is authorized to charge Orrick's Deposit Account No. **15-0665** for any fees required under 37 CFR §§ 1.16 and 1.17 that are not covered, in whole or in part, by a check enclosed herewith and to credit any overpayments to said Deposit Account .

Respectfully submitted,

Orrick, Herrington & Sutcliffe LLP

Dated: February 20, 2004

By: ____________________
Joseph K. Liu
Reg. No. 51,957

4 Park Plaza, Suite 1600
Irvine, California 92614-2558
(949) 567-6700
Customer No. 34313

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Isaac Ostrovsky, et al.
Appl. No.	:	10/017,534
Filing Date	:	October 18, 2001
Title	:	**DIFFRACTION GRATING BASED INTERFEROMETRIC SYSTEMS AND METHODS**
Group Art Unit	:	2877
Examiner	:	Patrick J. Connolly
Docket No.	:	701470.19 (formerly 265/222)

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AMENDMENT AFTER FINAL OFFICE ACTION 37 C.F.R. § 1.116

Sir:

In response to the final Office Action mailed November 24, 2003, Applicants respond as follows:

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Amendments to the Claims

1. (currently amended) An interferometer comprising:

a low coherence light source;

a first beam splitter in communication with the light source to split light from the light source into a ~~first~~ sample light beam to be directed onto a sample and a reference light beam, wherein a ~~second~~ reflected sample light beam is received by the interferometer from the sample;

a diffraction grating positioned to diffract at least one of the reference light beam and the ~~second~~ reflected sample light beam;

a second beam splitter positioned to receive the ~~second~~ reflected sample light beam and the reference light beam, wherein at least one of the ~~second~~ reflected sample light beam and the reference light beam has been diffracted by the diffraction grating, and the ~~second~~ reflected sample light beam and the diffracted reference light beam are combined in the second beam splitter to form a combined light beam; and

a detector positioned to receive the combined light beam from the second beam splitter.

2. (currently amended) The interferometer of claim 1, wherein the diffraction grating is positioned to diffract the reference light beam and the ~~second~~ reflected sample light beam is directed onto the second beam splitter without being diffracted.

3. (original) The interferometer of claim 1, wherein the diffraction grating is a reflective diffraction grating, a transparent diffraction grating or an acousto optic modulator.

4. (original) The interferometer of claim 1, wherein the detector is a multi-element

photo detector.

5. (original) The interferometer of claim 1, further comprising a signal processor electrically coupled to the detector to receive an output from the detector and to process the output.

6. (original) The interferometer of claim 1, wherein the second beam splitter forms first and second combined light beams, the first combined light beam being received by the first detector, the interferometer further comprising:

a second detector positioned to detect the second combined light beam.

7. (original) The interferometer of claim 6, further comprising first and second polarization filters positioned to filter the first and second combined light beams, respectively, with respect to first and second respective polarizations.

8. (original) The interferometer of claim 6, wherein the first and second detectors are each multi-element detectors.

9. (currently amended) The interferometer of claim 1, wherein:

the first beam splitter is an approximately 50/50 beam splitter; and

the second beam splitter directs more than half of the light energy of the ~~second~~ reflected sample light beam into the combined beam and directs less than half of the light energy of the reference light beam into the combined beam.

10. (currently amended) The interferometer of claim 9, wherein the second beam splitter directs substantially more than half of the light energy of the ~~second~~ reflected sample light beam into the combined light beam and directs substantially less than half of the light energy of the reference light beam into the combined beam.

11. (currently amended) The interferometer of claim 10, wherein the second beam splitter directs at least about 90% of the light energy of the ~~second~~ reflected sample light beam into the combined light beam and directs about 10% or less of the light energy of the reference light beam into the combined light beam.

12. (original) The interferometer of claim 1, wherein the first beam splitter directs more than half of the light energy received from the light source into the sample light beam and less than half of the light energy received from the light source into the reference light beam.

13. (currently amended) The interferometer of claim 12, further comprising an optical circulator, wherein the sample light beam is directed to the sample through the optical circulator and the ~~second~~ reflected sample light beam is directed to the second beam splitter through the optical circulator.

14. (original) The interferometer of claim 12, wherein the second beam splitter directs substantially more than half of the light energy received from the light source into the sample light beam and substantially less than half of the light energy received from the light source into the reference light beam.

15. (original) The interferometer of claim 14, wherein the first beam splitter directs at least about 90% of the light energy received from the light source into the sample light beam and about 10% or less of the light energy received from the light source into the reference light beam.

16. (currently amended) An interferometer comprising:

a first low coherence light source and a second low coherence light source, each emitting light at a different wavelength;

a first beam splitter in communication with the first and second light sources to

split the light from the light sources into a ~~first~~ sample light beam to be directed onto a sample and a reference light beam, wherein a ~~second~~ reflected sample light beam is received by the interferometer from the sample;

a diffraction grating positioned to diffract at least one of the reference light beam and the ~~second~~ reflected sample light beam;

a second beam splitter positioned to receive the reference light beam and the ~~second~~ reflected sample light beam, wherein at least one of the reference light beam and the sample light beam has been diffracted by the diffraction grating, the second beam splitter forming two combined light beams;

a first detector positioned to receive one of the combined light beams; and

a second detector positioned to receive the other of the combined light beams.

17. (original) The interferometer of claim 16, wherein the first detector detects light at the wavelength of the first light source and the second detector detects light at the wavelength of the second light source.

18. (original) The interferometer of claim 16, wherein the first and second detectors are multi-element detectors.

19. (original) The interferometer of claim 16, wherein one of the light sources emits light in a wavelength band that induces fluorescence in the sample.

20. (currently amended) The interferometer of claim 16, wherein:

the reference light beam is diffracted by the diffraction grating; and

the reflected ~~second~~ reflected sample light beam is directed onto the second beam splitter, undiffracted.

21. (original) The interferometer of claim 16, wherein light is conveyed from the first and second light sources to the beam splitter by an optical fiber.

22. (currently amended) An interferometer comprising:

a low coherence light source;

a first, fiber optic beam splitter;

a first optical fiber optically coupling the light source to the first beam splitter, wherein the first beam splitter splits light received from the light source into a sample light beam and a reference light beam;

a second optical fiber to convey the sample light beam onto a sample and to convey a ~~second~~ reflected sample light beam received from the sample to the first beam splitter;

a second beam splitter;

a third optical fiber optically coupling the first beam splitter to the second beam splitter to convey the ~~second~~ reflected sample light beam, at least in part, from the first beam splitter to the second beam splitter;

a diffraction grating;

a fourth optical fiber optically coupling the first beam splitter to the diffraction grating to convey the reference light beam, at least in part, to the diffraction grating;

wherein the second beam splitter is positioned to receive the diffracted reference light beam and the reference light beam and the ~~second~~ reflected sample light beam are combined in the second beam splitter to form a combined light beam; and

a detector positioned to receive the combined light beam.

23. (original) The interferometer of claim 22, wherein:

the first beam splitter is an approximately 50/50 beam splitter; and

the second beam splitter directs more than half of the light energy received from the light source into the sample light beam and less than half of the light energy received from the light source into the reference light beam.

24. (currently amended) The interferometer of claim 22, further comprising:

a focusing lens to focus the sample light beam onto the sample and to focus the ~~second~~ reflected sample light beam;

a first collimator optically coupled between the third optical fiber and the second beam splitter such that the third optical fiber conveys the ~~second~~ reflected sample light beam to the first collimator to collimate the ~~second~~ reflected sample light beam and the collimated sample light beam is directed to the second beam splitter;

a second collimator optically coupled between the fourth optical fiber and the diffraction grating such that the fourth optical fiber conveys the reference light beam to the second collimator to collimate the reference light beam and the collimated reference light beam is directed onto the diffraction grating; and

a conjugating lens between the second beam splitter and the detector.

25. (original) The interferometer of claim 22, wherein the diffraction grating is a reflective diffraction grating, a transparent diffraction grating, or an acousto-optic modulator.

26. (original) The interferometer of claim 22, wherein the second beam splitter directs substantially more than 50% of the light energy received from the light source into the sample light beam and substantially less than 50% of the light energy received from the light

source into the reference light beam.

27. (original) The interferometer of claim 26, wherein the second beam splitter directs at least about 90% of the light energy received from the light source into the sample light beam and about 10% or less of the light energy from the light source into the reference light beam.

28. (original) The interferometer of claim 22, further comprising a catheter and an optical fiber within the catheter, wherein the second optical fiber is optically coupled to the optical fiber within the catheter.

29. (original) The interferometer of claim 22, further comprising a phase modulator to modulate either of the reference light beam and the sample light beam.

30. (original) The interferometer of claim 22, further comprising a signal processor electrically coupled to the detector to receive an output from the detector and to process the output.

31. (original) The interferometer of claim 22, wherein the light source is pulsed.

32. (original) The interferometer of claim 22, wherein the detector is a multi-element photo detector.

33. (currently amended) An interferometer comprising:

a low coherence light source;

a first fiber optic beam splitter;

a first optical fiber optically coupling the light source to the first beam splitter, wherein the first beam splitter splits light received from the light source into a sample light beam and a reference light beam;

an optical circulator having a first port, a second port and a third port, wherein light input to the first port exits the optical circulator from the second port and light entering the second port exits the optical circulator from the third port;

a second optical fiber optically coupling the first beam splitter to the first port of the optical circulator;

a third optical fiber to convey the sample light beam to a sample and to convey a ~~second~~ reflected sample light beam received from the sample to the first beam splitter;

a second beam splitter;

a fourth optical fiber optically coupling the third port of the optical circulator to the second beam splitter, wherein the third optical fiber conveys the ~~second~~ reflected sample light beam, at least in part, from the third port to the second beam splitter;

a diffraction grating;

a fifth optical fiber optically coupling the first beam splitter to the diffraction grating to convey the reference light beam, at least in part, to the diffraction grating;

the second beam splitter being positioned to receive the diffracted reference light beam from the diffraction grating, wherein the reference light beam and the ~~second~~ reflected sample light beam combine in the beam splitter to form a combined light beam; and

a detector positioned to receive the combined beam

34. (original) The interferometer of claim 33, wherein the light received from the light source has an energy and the first beam splitter splits the light into a sample light beam having more than half of the energy of the light and a reference light beam having less than half of the energy of the light.

35. (currently amended) The interferometer of claim 34, further comprising:

a focusing lens to focus the sample light beam onto the sample and to focus the ~~second~~ reflected sample light beam;

a first collimator optically coupled between the fourth optical fiber and the second beam splitter such that the fourth optical fiber conveys the ~~second~~ reflected sample light beam to the first collimator to collimate the ~~second~~ reflected sample light beam and the collimated sample light beam is directed to the second beam splitter;

a second collimator optically coupled between the fifth optical fiber and the diffraction grating such that the fifth optical fiber conveys the reference light beam to the second collimator to collimate the reference light beam and the collimated reference light beam is directed onto the diffraction grating; and

a conjugating lens between the second beam splitter and the detector.

36. (currently amended) The interferometer of claim 34, wherein the second beam splitter is an approximately 50/50 beam splitter and the ~~second~~ reflected sample light beam and the reference light beam are combined in the second beam splitter to form first and ~~second~~ reflected sample light beams, wherein the first combined light beam is received by the first detector; and

the interferometer further comprises a second detector positioned to receive a second combined light beam from the second beam splitter.

37. (original) The interferometer of claim 34, further comprising first and second conjugating lens between the first detector and the second beam splitter and the second detector and the second beam splitter, respectively.

38. (original) The interferometer of claim 36, wherein the first and second detectors are each a multi-element photo detector.

39. (original) The interferometer of claim 36, further comprising first and second polarization filters positioned to filter the first and second combined light beams, respectively, with respect to first and second respective polarizations.

40. (original) The interferometer of claim 36, further comprising:

a second light source optically coupled to the first optical fiber, the second light source emitting light at a wavelength different than the wavelength of the first light source;

wherein the first detector detects light at a wavelength corresponding to the wavelength of the light emitted by the first light source and the second detector detects light at a wavelength corresponding to the wavelength of the light emitted by the second light source.

41. (original) The interferometer of claim 40, wherein one of the light sources emits light in a wavelength band that induces fluorescence in the sample.

42. (currently amended) The interferometer of claim 34, wherein the second beam splitter directs more than half of the energy in the ~~second~~ reflected sample light beam into the combined beam and less than half of the energy in the reference light beam into the combined beam.

43. (currently amended) The interferometer of claim 34, further comprising a phase modulator to modulate either one of the reference light beam and the ~~second~~ reflected sample light beam

44. (original) The interferometer of claim 34, wherein the diffracting grating is a reflective diffraction grating, a transparent diffraction grating, or an acousto-optic modulator

45. (original) The interferometer of claim 36, further comprising a catheter, wherein at least a portion of the third optical fiber is within the catheter.

46. (original) The interferometer of claim 34, further comprising a catheter, wherein at least a portion of the third optical fiber is within the catheter.

47. (original) The interferometer of claim 34, further comprising:

a signal processor electrically connected to the detector to receive an output from the detector and to process the signals.

48. (original) The interferometer of claim 34, wherein the light source is pulsed.

49. (original) The interferometer of claim 34, wherein the first beam splitter splits the light received from the light source into a sample light beam having substantially more than half of the energy of the light and a reference light beam having substantially less than half of the energy of the light.

50. (original) The interferometer of claim 49, wherein the first beam splitter directs at least about 90% of the light energy received from the light source into the sample light beam and about 10% or less of the light energy received from the light source into the reference light beam.

51. (original) The interferometer of claim 36, wherein the first beam splitter splits the light received from the light source into a sample light beam having substantially more than half of the energy of the light and a reference light beam having substantially less than half of the energy of the light.

52. (original) The interferometer of claim 51, wherein the second beam splitter directs at least about 90% of the light energy received from the light source into the sample light beam and about 10% or less of the light energy received from the light source into the reference

light beam.

53. (currently amended) An interferometer comprising:

a low coherence light source;

a first beam splitter in communication with the light source to split light from the light source into a sample light beam to be directed onto a sample and a reference light beam, wherein a second light beam is received by the interferometer from the sample;

a second beam splitter for generating two combined light beams from the ~~second~~ reflected sample light beam and the reference light beam, wherein an optical path difference has been introduced into at least one of the ~~second~~ reflected sample light beam and the reference light beam;

first and second detectors, each positioned to receive one of the combined light beams;

first and second polarization filters, each filtering light with respect to a different polarization, the first polarizing filter being between the second beam splitter and the first detector and the second polarizing filter being between the second beam splitter and the second detector.

54. (original) The interferometer of claim 54, wherein each detector is a multi-element detector.

55. (original) The interferometer of claim 54, further comprising a signal processor coupled to each detector to analyze the outputs of each detector.

56. (currently amended) The interferometer of claim 54, further comprising a diffraction grating to introduce the optical path difference to at least one of the ~~second~~ reflected

sample light beam and the reference light beam.

57. (original) The interferometer of claim 56, wherein the diffraction grating introduces the optical path difference to the reference light beam.

58. (currently amended) A method of imaging a sample material comprising the steps of:

splitting a low coherence light beam into a sample light beam and a reference light beam;

directing the sample light beam onto a sample and receiving a ~~second~~ reflected sample light beam from the sample;

diffracting one of the reference light beam and the ~~second~~ reflected sample light beam;

after the diffracting step, combining the ~~second~~ reflected sample light beam with the diffracted light beam by a beam splitter to form a combined light beam; and

detecting the combined light beam with a detector.

59. (original) The method of claim 58, further comprising the steps of:

splitting the low coherence light beam by a first, approximately 50/50 beam splitter; and

combining the light received from the sample with the diffracted reference light beam by a second non 50/50 beam splitter.

60. (original) The method of claim 59, further comprising the steps of:

conveying the low coherence light beam to a first beam splitter to split the light beam, by a first optical fiber;

conveying the sample light beam to a lens to focus the light beam onto the sample, by a second optical fiber;

conveying the light received from the sample back to the first beam splitter by the second optical fiber;

conveying the light received from the sample from the first beam splitter to a first collimator, by a third optical fiber;

conveying a collimated received light beam to the second beam splitter;

conveying the reference light beam from the first beam splitter to a second collimator by a fourth optical fiber; and

conveying a collimated reference light beam to a diffraction grating to diffract the collimated reference light beam.

61. (original) The method of claim 59, further comprising the step of combining the light received from the sample with the diffracted reference light beam to form a combined light beam having substantially more than half of the light energy of the light received from the sample and substantially less than half of the light energy of the diffracted reference light beam.

62. (original) The method of claim 61, comprising the step of combining the light received from the sample with the diffracted reference light beam to form a combined light beam having at least about 90% of the light energy of the light received from the sample and about 10% or less of the light energy of the diffracted reference light beam.

63. (original) The method of claim 59, wherein the sample is biological tissue.

Claims 64–73 (canceled)

REMARKS

Claims 1-63 are currently pending, of which claims 1, 16, 22, 33, 53, and 58 are independent. Claims 1, 2, 9, 10, 11, 13, 16, 20, 22, 24, 33, 35, 36, 42, 43, 53, 56, and 58 have been amended. "First sample light beam" and "second sample light beam" are now referred to as "sample light beam" and "reflected sample light beam" respectively. Applicants believe that the claims are now currently in condition for allowance over the cited prior art.

As to claims 1 and 58, while the Zeylikovich reference may teach an apparatus having first and second beam splitters, the reference does not disclose having a reflected sample light beam and a diffracted reference light beam combined in the second beam splitter to form a combined light beam as required by Claim 1. Nor does Zeylikovich disclose combining a reflected sample light beam with a diffracted light beam by a beam splitter to form a combined light beam as required by Claim 58.

As to claims 3-5, because claim 1 is patentably distinguishable over the Zeylikovich reference, then so are claims 3-5, which are dependent on claim 1.

Further, with regard to the Zeylikovich reference in combination with Swanson (U.S. Patent No. 5,459,570), and the Zeylikovich reference in combination with Tearney (U.S. Patent No. 6,134,003), none of these references, in combination or separately, teach or suggest combining the elements of the instant invention. Specifically, none of these references, in combination or separately, teach or suggest having a reflected sample light beam and a diffracted reference light beam combined in a second beam splitter as required by claims 1, 22, and 33; having a second beam splitter form two combined light beams from the reflected sample beam and the diffracted reference beam, as required by claim 16; having a second beam splitter for

generating two combined light beams from a reflected sample light beam and a reference light beam as required by 53; or combining a reflected sample light beam with a diffracted light beam by a beam splitter to form a combined light beam as required by claim 58.

Accordingly, independent claims 1, 16, 22, 33, 53 and 58 are patentable over the cited references, in combination or separately, as is the corresponding dependent claims.

Applicant : Isaac Ostrovsky et al.
Appl. No. : 10/017,534
Examiner : Patrick J. Connolly
Docket No. : 701470.19

Conclusion

Prompt and favorable action on the merits of the claims is earnestly solicited. Should the Examiner have any questions or comments, the undersigned can be reached at (949) 949-852-7745.

The Commissioner is authorized to charge any fee which may be required in connection with this Amendment to Deposit Account No. 150665.

Respectfully submitted,

ORRICK, HERRINGTON & SUTCLIFFE LLP

Dated: February 20, 2004

By: ______________________
Joseph K. Liu
Reg. No. 51,957

Orrick, Herrington & Sutcliffe LLP
4 Park Plaza, Suite 1600
Irvine, CA 92614-2558
Tel. 949-567-6700
Fax: 949-567-6710
Customer Number: 34313

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ORRICK

ORRICK, HERRINGTON & SUTCLIFFE LLP
4 PARK PLAZA
SUITE 1600
IRVINE, CALIFORNIA 92614-2558
tel 949-567-6700
fax 949-567-6710
WWW.ORRICK.COM

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Joseph K. Liu	(949) 852-7745	(949) 567-6710

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ORRICK, HERRINGTON & SUTCLIFFE, LLP
4 PARK PLAZA
SUITE 1600
IRVINE, CA 92614-2558

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Advisory Action	Application No. 10/017,534	Applicant(s) OSTROVSKY ET AL.
	Examiner Patrick J Connolly	Art Unit 2877

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 29th April 2004 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE. Therefore, further action by the applicant is required to avoid abandonment of this application. A proper reply to a final rejection under 37 CFR 1.113 may only be either: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114.

PERIOD FOR REPLY [check either a) or b)]

a) ☐ The period for reply expires ______months from the mailing date of the final rejection.

b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
ONLY CHECK THIS BOX WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

1.☐ A Notice of Appeal was filed on _____. Appellant's Brief must be filed within the period set forth in 37 CFR 1.192(a), or any extension thereof (37 CFR 1.191(d)), to avoid dismissal of the appeal.

2.☒ The proposed amendment(s) will not be entered because:

(a) ☐ they raise new issues that would require further consideration and/or search (see NOTE below);

(b) ☐ they raise the issue of new matter (see Note below);

(c) ☒ they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

(d) ☐ they present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: *See Continuation Sheet*.

3.☐ Applicant's reply has overcome the following rejection(s): _____.

4.☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

5.☐ The a)☐ affidavit, b)☐ exhibit, or c)☐ request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.

6.☐ The affidavit or exhibit will NOT be considered because it is not directed SOLELY to issues which were newly raised by the Examiner in the final rejection.

7.☐ For purposes of Appeal, the proposed amendment(s) a)☐ will not be entered or b)☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.

The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: _____.

Claim(s) objected to: _____.

Claim(s) rejected: _____.

Claim(s) withdrawn from consideration: _____.

8.☐ The drawing correction filed on _____ is a)☐ approved or b)☐ disapproved by the Examiner.

9.☐ Note the attached Information Disclosure Statement(s)(PTO-1449) Paper No(s). _____.

10.☐ Other: _____

Samuel A. Turner
Primary Examiner

Continuation of 2. NOTE: The claims still contain alternative language that renders them unclear and fails to distinguish them from prior art. An example of this alternative language can be found in claim 1, lines 7 and 10 wherein the phrasing "at least one of" the reference beam and reflected sample beam is used. This does not distinguish which beam is to be diffracted such that either or both could be diffracted by the grating. The Zeylikovich reference teaches diffracting both beams.